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ABSTRACT

A familiarization procedure was used in two experiments investigating word encoding in second and sixth graders. Previous studies using release from proactive inhibition had indicated that developmental changes on some encoding dimensions occur during this period. It is argued that the dependence of release from proactive inhibition on deliberate recall decreases its pertinence to the process of encoding. In the experiments, 20 second graders and 20 sixth graders were individually familiarized to a single semantic category. In experiment 1, the children were exposed to either a series of animal names or words designating body parts. In experiment 2, these categories were replaced with positive and negative words. A two-choice reaction time task followed familiarization. The targets for the task were two words: an animal name and a body part name for experiment 1, and a positive and a negative word for experiment 2. In both experiments, children of both age groups responded faster to the word from the familiarized category than to the novel word. Experiment 1 confirmed previous findings that the taxonomic classes animals and body parts are encoded by children, while experiment 2 revealed that children also encode the evaluative connotation of words, a finding that had previously emerged only inconsistently. (Author/JB)

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# Semantic Encoding in Children: A New Method of Investigation

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Abstract

A familiarization procedure was used in two experiments investigating word encoding in second- and sixth-graders. Previous studies using release from proactive inhibition have indicated that developmental changes on some encoding dimensions occur during this period. We argue that the dependence of release from proactive inhibition on deliberate recall decreases its pertinence to the process of encoding. Experiment 1 confirmed previous findings that the taxonomic classes animals and body parts are encoded by children in both grades. Experiment 2 revealed that children in both grades also encode the evaluative connotation of words, a finding that has previously emerged only inconsistently.

The primary concern of this paper is a new technique for studying children's semantic encoding. This technique was developed in research concerned with attention and it has led us to the view that semantic encoding is an attentional phenomenon rather than, as tradition has it, a memory process. Our reasons for favoring this point of view will be described shortly. First, I will briefly describe the research that led us to study semantic encoding.

Consider the following simple experiment. A 6- or 7-year old child sits before a rear projection screen and is shown 30 or so brief (2-3 sec.) presentations of a single stimulus, perhaps a blue circle. The child does nothing but look at the stimulus each time it is presented. Following this familiarization, the child performs a two-choice reaction time task for 40-50 trials. The repeatedly presented color is the target for half the trials and a novel color, say red, is the target for the remaining trials. The finding from more than a dozen studies of this type, some conducted in our laboratories, but many conducted by Gordon Cantor and his colleagues (cf. Canton, 1969), is that children respond more slowly to a familiarized color than to a novel color.

We speculated this finding might be due to changes in two components of attention identified in the work of Michael Posner and Stephen Boies (1971). One of these components, alertness, refers to processes responsible for developing a general response readiness to any event. The

second component, encoding, refers to processes that select specific information from an event. We hypothesized that stimulus repetition affects these two components in opposite ways. Specifically, alerting properties of a familiarized stimulus were presumed to decrease, but the encoding of a familiarized stimulus was held to be facilitated. In several experiments we have provided evidence for these opposite effects (e.g., Kraut, 1976; Kraut & Smothergill, 1978; Smothergill & Kraut, in press a; in press b). Depending on which component of attention is experimentally manipulated responses have been shown to be either slower to a familiarized stimulus than to a novel stimulus (an alertness decrement effect) or faster to a familiarized stimulus than to a novel stimulus (an encoding facilitation effect). For example, a non-discriminant warning signal preceded target onset on test trials in one experiment. The purpose of the warning signal was to offset alertness decrement to the familiarized stimulus and thereby allow the encoding facilitation effect to become manifest. As expected the familiarized stimulus was responded to faster than the novel under these conditions.

It is important to note that these reaction time procedures for studying encoding facilitation monitor the way information is handled on its way into the processing system. This would seem appropriate in light of a widely accepted definition of encoding as "processes that translate external information into internal information" (Melton & Martin, 1972, p. xii).

In contrast, it seems something of a paradox that the principle method prior to this by which children's semantic encoding has been studied is deliberate recall, a method which focuses an information on its way out of the system. This is the release from proactive inhibition method (cf. Wickens, 1970; 1973). Under it, children are presented two or three words, perform a distractor task, and are then asked to recall the words. Three or four trials make up the task. Different words are presented on each of the first few trials, but all share some common feature. For example, they all might be animals names. On the final trial the words are from a different category, for example color names. Semantic encoding is inferred from two results: a decrease in recall from the first to the penultimate trial, the presumed consequence of a buildup of proactive inhibition; and an increase in recall on the final trial, due to a release from proactive inhibition. A recent review of studies using this method (Kail & Seigel, 1977) indicates that children as young as preschool age encode denotative characteristics of words, such as whether a word represents an animal or not, but that it is not until late childhood or early adolescence that consistent evidence is found for encoding connotative features, such as whether a word is positively or negatively evaluated.

It is apparent that encoding under the proactive inhibition method is inferred from changes in deliberate recall. Encoding is assumed to have occurred to the extent that recall follows the decrease-followed-by-an-increase pattern. But if encoding is concerned with information on the way into the system, deliberate recall would seem to provide very indirect measure of it. Certainly, if information is recalled it must have been encoded; but a failure to recall does not mean information was not encoded since encoded information might not recalled for a variety of reasons related to memory and unrelated to encoding.

In sum, the practice of treating encoding as a memory process rather than a perceptual or an attentional process has the potential for misleading conclusions about the developmental course of semantic encoding. The familiarization procedure, in contrast, providing a measure of time needed to encode a stimulus into the categories of familiar or novel, is a potentially more sensitive technique for studying semantic encoding.

Two experiments are reported here in support of this contention. Experiment 1 was designed to determine whether findings from the familiarization procedure would confirm a major positive finding about semantic encoding that has come out of studies using release from proactive inhibition. Proactive inhibition studies have consistently shown that young children encode word taxonomy, a denotative characteristic. Consequently, taxonomic encoding was investigated using a

modified familiarization procedure in Experiment 1. Animal names and body part names were the specific taxonomic categories studied. Experiment 2 was designed to test for evaluative encoding, a connotative dimension for which release from proactive inhibition sutdies have not yielded consistent findings. We reasoned that inconsistent findings might arise if a dimension was encoded but the experimental technique used to detect it was relatively insensitive. So, it was hypothesized that young children would show evidence of evaluative encoding under the familiarization method. Positive and negative evaluation words from the semantic differential were used as stimuli in this experiment. Both experiments used a similar method.

In each experiment 20 second graders and 20 sixth graders were first individually familiarized to a single semantic category. Children were seated approximately 1 m from a rear projection screen onto which a series of 30 words, exposed for 3 sec each, was presented. The series was comprised of five four-letter words selected from only one semantic category. The words were either animal names or body part names in Experiment 1 (e.g., lion, goat, or head, nose) or positive or negative evaluation words in Experiment 2 (e.g., nice, live, or, sour, cold). Each word was presented six times in random order and all the words used were in the reading vocabularies of all the children. Instructions were simply to watch the words for as long and as often as often as they were presented.

A two-choice reaction time task immediately followed familiarization. The targets for the task were two words: an animal name and a body part name for Experiment 1; or a positive and a negative word for Experiment 2. It is important to note that neither word had been presented during familiarization. That is, the target word selected from the familiarized category was not one of the five words presented repeatedly beforehand. Two index cards, each containing a target word, were paired with two response keys located in front of the child. Children were instructed to place their preferred hand midway between the two response keys and to quickly press one key any time the word associated with it appeared on the screen and the second key any time the word associated with it appeared.

Forty reaction time trials were conducted. One animal name and one body part name in Experiment 1 and one positive and one negative word in Experiment 2 were randomly presented 20 times each. The specific two words used in the task varied across subjects. In addition, a warning signal (a slide of a red circle) preceded each word presentation by 500 msec.

It was anticipated that faster responses would occur to the word from the same category as the familiarized words if the category had been encoded during familiarization and if that familiarization resulted in encoding facilitation during test. Results were positive. Children from both grades and in both experiments responded faster to the word

from the familiarized category than to the word from the novel, p's <.001. The only other significant result was that, also in each experiment, sixth graders responded faster than second graders, p's <.001. In neither experiment did it matter whether the familiarized category was animal names or body part names (Exp. 1), or positive, or negative (Exp. 2). No interactions were significant (Exp. 1 M RTs: 852 vs. 920 msec for second graders; 722 vs. 793 msec for sixth graders; Exp. 2 M RTs: 930 vs. 1018 msec for second graders; 708 vs. 776 msec for sixth graders.

These findings suggest that familiarization is an appropriate and sensitive technique for investigating semantic encoding in children. Previous knowledge about the kinds of taxonomic encoding categories young children use has been confirmed and previously inconsistent results concerning evaluative encoding have been put on firmer foundation. The reason for the success of this research may well lie in the familiarization procedure being a more appropriate technique for studying encoding processes than previously used procedures.

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